

## COVID-19, Cardiological Issues & Health Education

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### ABSTRACT

Polymorbidity is a major concern in medicine and public health, and recent developments have given evidence of alarming interactions between COVID-19 and cardiovascular diseases. For decades cardiology has been promoting preventative measures and highlighted the importance of risk factors, healthy life styles, physical exercise and stress-management. By contrast, COVID-19 measures have been dominated by social isolation, quarantine and intensive care and thus given rise to the question how to strengthen the immune system of the general population. Moreover, pathological sequelae of COVID-19 measures and political conflicts became a heterogeneously discussed topic.

In this context, Beijing Normal University (BNU) is about to issue a comprehensive health education programme that includes cardiovascular and immunological perspectives. The programme is based on translational studies replacing 'bedside' with 'school bank'. It involves educational sciences, evidence based medicine, differential and clinical psychology, cultural anthropology and public health. The present article outlines the programme's framework, which is based on systemic meta-syntheses of preventative medicine and particularly focuses on educational and sustainable transfer that addresses the entire younger generation.

Similar to rehabilitation, long-term adherence is a main issue, which involves individual preference of health-promoting measures, and cardiovascular fitness, improvement of the immune system, avoidance of obesity and stress, body awareness and knowledge of one's own risk profile are cornerstones. Educational and preventive interventions comprise a broad spectrum of models such as dance therapy, creative martial arts or vocal therapies. Implementation within the Chinese school and public health system is targeted.

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### Introduction

COVID-19 has become a unique pandemic and can be regarded as a singular phenomenon in the history of medicine. However, the reason for this singularity is not only given by its novel pathogen SARS-CoV-2, which exhibits a certain genetic diversity and rapid evolution, but also by the way how it attracted world-wide attention and has given rise to disease management with enormous social impact [1,2]. Moreover, how media and policy have been portraying the pandemic has greatly influenced mental health and particularly in children long-term psychopathological sequelae are expected [3,4].

Until today, the pathological estimation of this pandemic is heterogeneous and even contradictory. One of the first clinical studies declared that COVID-19 is mild in children and a review stated [6] that 'the disease is mild in most people; in some (usually the elderly and those with comorbidities), it may progress to pneumonia, acute respiratory distress syndrome (ARDS) and multi organ dysfunction. Many people are asymptomatic' [5]. By contrast, other studies call SARS-COV2 the 'causative agent of a potentially fatal disease that is of great global public health

concern' [6].

Broadly speaking, medical research and epidemiological considerations have given rise to two completely dissimilar models to encounter COVID-19. One votes for social isolation, quarantine and lockdown, while the other highlights the importance of good health and a robust immune system and suggests to precisely identify individuals who are at high risk. This concerns on the one hand comorbidities and the fact that 'hypertension, diabetes, COPD, cardiovascular disease, and cerebrovascular disease are major risk factors for patients with COVID-19'. On the other hand, the second approach calls for measures to strengthen the immune system and to be aware of one's own risk factors [7].

Taking into consideration that pandemics are a regular threat of human life, this polarity matters and calls for pertinent guidelines for public health and health education. The history of mankind is full of epi- and pandemics. Blondheim referred to the report of a pneumonic plague in the Old Testament, the medieval Black Death is a major topic in historical epidemiology, the 1918 Spanish flu epidemic ranks among the deadliest flu seasons infecting about one-third of the world's population, and more recent events comprise the 2002-2004 SARS, the 2009 (H1N1) flu pandemic and the 2014-2016 Ebola killing up to 50 percent of those who

got sick [8,9].

It is self-evident that COVID-19 is not the last pandemics and pros and contras of the experienced measures call for interdisciplinary consideration and reasonable strategies to encounter similar threats in future. Considering social isolation and lockdown main interventions seems too simplistic, hence this short communication's suggestion of a more active approach in public health.

### **Cardiovascular Issues, Covid-19 and Future Challenges**

Co- and polymorbidity have become a major concern of public health and are associated with 'higher mortality, disability, side effects of treatment, increased use of health system resources, and also with a lower quality of life' [10]. Moreover, co- and polymorbidity are not only an addition or accumulation of various diseases but have to be understood as an interacting system with mutually escalating factors. Given that cardiovascular diseases are still the leading cause of global death and that pandemic spread quickly across countries and continents, pathological interactions between the cardiovascular and the immune system matter.

There is a relatively high prevalence of cardiovascular disease among patients with COVID-19. More than 7% of patients are estimated to experience myocardial injury from the infection and a study from Zhengzhou University suggests that COVID-19 also might cause acute myocardial injury and chronic damage to the cardiovascular system [11,12]. COVID-19 may also affect multiple organs, particularly the cardiovascular system, and mortality is increased by comorbidities such as cardiovascular disease, hypertension, diabetes, chronic pulmonary disease and cancer [13].

At this point, the issue of susceptibility comes into play: What states of the cardiovascular and the immune system represent critical factors and how can these conditions be influenced by active preventative measures? Reviewing the relevant literature shows a certain lack of pertinent research. Although statistical correlations are well described, there is an obvious need of studies evaluating factors that help to control the pathological complex of COVID-19 and cardiovascular diseases. And yet, our aims do not stop at this point and improvement of the cardiovascular and immune system as a public health challenge gains momentum.

### **Cardiovascular Health, Immunity and Education**

Since the legendary Interheart Study of 2004, the identification of risk factors of myocardial infarction has enormously influenced cardiological prevention and implementation in long-term cardiac rehabilitation has shown convincing effects [14,15]. With regard to preventative measures and sustainable health education, improving both cardiovascular states and the immune system involve very similar approaches and on the basis of metasyntheses Beijing Normal University suggests a broad spectrum health programme at schools, cardiological and immunological targets included.

### **Individual Risk Factors**

Efficient strengthening of the immune and cardiovascular systems requires the knowledge of deficiencies and it cannot be taken for granted that individuals know their cardiovascular and immune profiles and risks. This concerns inherited and acquired immunodeficiencies such as the common variable immune deficiency as well as inherited and acquires cardiovascular conditions. While awareness of accumulated infections and/or cardiovascular events in one's family is a good first indicator, also genetic testing comes into play [16,17]. While identification of individual risk factors can be regarded as a general paediatric

and public health concern, actual measures greatly depend on feasible infrastructures and affordable expenses, and the question of pertinent screening techniques arises.

### **Sustainability and Adherence**

There is a huge gap between medical knowledge and the readiness of individuals to adhere to preventive and health promoting programmes. For decades patient adherence has been a core challenge and prevention faces similar issues [18]. However, these cannot be sufficiently handled by medicine, but greatly require psychological and educational support. Adherence to healthy life styles and control of immunological and cardiological risk factors decisively depends on personality features and the development of health-oriented behaviour.

In general, only school systems have the possibility to reach the whole younger population and to develop sustainable health awareness, readiness for prevention and adequate skills. This is a core task of health education and a main target of the Beijing Normal University research programme, which involves the experience of identity with health activities such as sports disciplines and music-based relaxation [19].

### **Physical Exercise**

A wealth of studies substantiated the irrefutable benefits of physical exercise including a favourable cardiovascular risk profile, particularly with regard to hypertension, promotion of longevity, retarded onset of dementia and alleviation of depression. However, physical exercise not only improves psychophysiological conditions but also influences epigenetic adaptations of the cardiovascular system [20-22]. From a sports cardiological perspective training frequency and well adjusted intensity matter and experienced identity with sports disciplines have an impact on sustainable adherence.

Additionally, there is robust evidence that regular physical activity and frequent exercise enhance immune competency and immune regulation [23]. Similar to the importance of the dose of physical exercise for cardiovascular health, also immunology suggests that prolonged periods of intensive exercise training can depress immunity, while regular moderate intensity exercise is considered beneficial [24]. In this context the BNU-study refers to cardiological and immunological results and focuses on translational effects in health education such as providing models of dance therapy or creative martial arts which can be adjusted to the students physiological conditions and personal preferences.

### **Stress Management**

Psychological conditions such as depression or anxiety greatly influence the cardiovascular system and stress is considered a dangerous trigger in the development and progression of cardiovascular diseases [25,26]. Taking the adverse impact of COVID-19, psychosocial circumstances and related steps in health policy, which caused loneliness and social isolation, on mental health into account, long-term effects on the cardiovascular system such as post-traumatic stress gain momentum [27-29].

Similarly, psychoneuroimmunology highlights that 'the brain can interfere with the immune system, where chronic psychological stress inhibits many functions of the immune system [30]. On the other hand, chronic peripheral inflammation – whether mild (during aging and psychological stress) or severe (chronic inflammatory diseases) – clearly interferes with brain function, leading to disease sequelae like fatigue but also to overt psychiatric illness'.

In spite of severe and potentially life threatening developments, ‘most of the COVID-19 patients have mild or moderate courses’ and comparison with epidemics such as the Ebola virus disease with a fatality rate of about 50% (according to WHO information) gives rise to the discussion why COVID-19 attracted so much attention and entailed such massive political steps and why, e.g., the fresh Ebola outbreak in summer 2020 is widely ignored. At the same time BBC Health reports a ‘flu virus with “pandemic potential” found in China’ [31-33]. Epidemiological views and political measures seem to be biased.

Although we cannot predict how governments and national health policies will respond to new epi- and pandemics, this article emphatically suggests to improve the cardiovascular and immune system in the general population and to carefully handle social restrictions and to abide by scientifically based epidemiological guidelines. The future of epidemics and pandemics will greatly challenge public health and health education, and this is what Beijing Normal University is going in for.

Arts therapeutic models such as Chinese Guqin (a traditional string instrument) therapy or Chinese calligraphy therapy are viable means to reduce stress through self-regulation techniques, and these are a main focus in the BNU health education programme. These arts therapeutic approaches also call for comparative studies, e.g. taking the impact of mindful meditation on the immune system into consideration [34].

#### **Sleep Quality**

Discussing ‘how to boost your immune system’, the Harvard Medical School recommends to ‘get adequate sleep’ [35]. However, sleep disorders are relatively frequent in children and consequently an implicit threat for the immune system. Given that ‘sleep in children is an important and dynamic process, affecting numerous aspects of health and development’, impaired sleep is likely to entail a broad spectrum of health issues [36].

It goes without saying that particularly stress- and anxiety-related sleep disorders need an adequate readjustment of their triggers, which also may encompass school stress and achievement anxiety. Generally, sleep disorders are a relatively common sociocultural phenomenon with multiple adverse sequelae and require therapeutic support [37]. Arts therapies provide a wealth of models to treat sleep disorders and to enhance sleep quality and the BNU health educational programme particularly focuses on arts-based self-regulation techniques to improve healthy sleep and thus to contribute to immunological and cardiovascular health.

#### **Obesity and Metabolic Syndrome**

‘As the prevalence of obesity in adults and youth continues at historically high rates, so does the occurrence of obesity-related comorbidities’ and a broad spectrum of cardiological sequelae and issues such as cardiometabolic risk factors comes into play [38,39]. Overweight and obesity in children increase the risk of adult metabolic syndrome, hence the call for adequate health educational programmes [40].

Moreover, ‘recent findings have highlighted the substantial impact that obesity and MetS parameters have on immunity and pathogen defence, including the disruption of lymphoid tissue integrity; alterations in leukocyte development, phenotypes, and activity; and the coordination of innate and adaptive immune responses [41]. These changes are associated with an overall negative impact on chronic disease progression, immunity from infection, and vaccine efficacy.’

Within the BNU health education programme, many interventions to prevent metabolic syndrome and to increase cardiorespiratory health and fitness are alike. They essentially involve dance therapy, sports medicine and body awareness, which plays a crucial role throughout the programme. Broadly speaking, arts- and exercise-based models with multiple favourable effects, cardiovascular and immunological benefits included, characterise this approach and increase sustainability.

#### **Public Health Responsibility**

Looking back to the origin of COVID-19 sheds light on the importance of transparent public health systems, quick, pertinent and anxiety avoiding information, and behavioural skills to comply with preventative measures [42]. These questions, however, also touch upon a multitude of further epidemiological, ethical and political issues. The problem which endemic level is tolerable (or even intended) goes hand in hand with the question of social isolation and quarantine, and we have to ask whether the whole population has to be protected or measures should rather focus on individuals exhibiting high risk conditions.

Analyses of the recent COVID-19 measures raise the question whether – due to incalculable political decisions – social and professional life plans have become vague, if we are expecting the end of sports and cultural events, and lockdowns and online-learning with empty schools will be the norm. This is no more a single epidemiological question but greatly involves socio-cultural issues, health philosophy, and the ethics of public health. Competence and a common sense of responsibility, which are key issues of the BNU-programme of health education, gain momentum.

#### **Conclusion**

It goes without saying that this programme is not the endpoint of our study but rather a frame, which suggests guidelines for interdisciplinary research comprising cardiology, immunology, public health, personality psychology and educational sciences.

The current research encompasses empirical studies combining educational approaches and designs of evidence based medicine as well as systemic meta-syntheses. Outcomes should not only improve Chinese health education but also serve as a reference model for similar movements in other countries.

The whole programme shall improve empowerment and self-reliability and provide active measures, which are designed to complement external means to control epidemiological processes. Finally this programme aims to help encounter future pandemics in a way that allow to minimise restrictions and their psychopathological sequelae and socio-economical harm.

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